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THE EVOLVING U.S. HEALTH WORKFORCE

Veterans' Location in Health Professional Shortage Areas: Implications for Access to Care and Workforce Supply

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Objective. To describe the distribution of Veterans in areas of the United States where there are potentially inadequate supplies of health professionals, and to explore opportunities suggested by this distribution for fostering health workforce flexibility.

Data Sources. County-level data from the 2015–2016 Health Resources and Services Administration's (HRSA's) Area Health Resources Files (AHRF) were used to estimate Veteran populations in HRSA-designated health professional shortage areas (HPSAs). This information was then linked to 2015 VA health facility information from the Department of Veterans Affairs.

Study Design. Potential Veteran populations living in Shortage Area Counties with no VHA facilities were estimated, and the composition of these populations was explored by Census division and state.

Principal Findings. Nationwide, approximately 24 percent of all Veterans and 23 percent of Veterans enrolled in VHA health care live in Shortage Area Counties. These estimates mask considerable variation across states.

Conclusions. An examination of Veterans residing in Shortage Area Counties suggests extensive maldistribution of health services across the United States and the continued need to find ways to improve health care access for all Veterans. Effective avenues for doing so may include increasing health workforce flexibility through expansion of nurse practitioner scopes of practice.

Key Words. Veterans, access, rural health care, community-based care, geographic analysis

The Department of Veterans Affairs/Veterans Health Administration (VA/VHA) provides health care to 6 million Veterans nationwide, including approximately 800,000 Veterans who served in Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn (Panangala 2015; Department of Veterans Affairs 2016). An additional 3 million Veterans are enrolled in the VHA health care system, but they are not currently receiving

their health care through VHA (Department of Veterans Affairs 2016). The total 9 million veterans currently enrolled in VHA health care is likely an underestimate of the number of veterans who could potentially qualify for VHA health care. The Congressional Budget Office (CBO) has suggested that approximately 60 percent of unenrolled Veterans—about 8 million additional Veterans—may be eligible for their health care through VHA (Congressional Budget Office 2014).

In recent years, the demand for VHA health care has grown, and this trend, coupled with other complex dynamics, has contributed to long appointment wait times and related health care access challenges for some Veterans (Bagalman 2014; Centers for Medicare and Medicaid Services 2015; Department of Veterans Affairs 2016). For instance, an Institute of Medicine (IOM) analysis of VHA data showed that, in 2014, the average wait time for new primary care appointments was 43 days, with a range of 2 to 122 days across all VHA facilities (Institute of Medicine 2015). The timeliness of obtaining both physical and behavioral health care is essential. Studies have shown that delays and extended wait times are associated with adverse health outcomes for a range of health conditions, from spinal fractures to heart disease (Institute of Medicine 2015). Timely access to behavioral health care is particularly important, and a number of analyses have indicated that treatment may be more effective and patients respond better if behavioral health care is delivered in a timely and well-coordinated manner (Institute of Medicine 2015).

In response to health care access issues, Congress passed the Veterans Access, Choice and Accountability Act of 2014 to increase health care access for eligible Veterans (Veterans Access, Choice and Accountability Act 2014). Under this legislation, VA instituted a temporary program authorizing health care-eligible¹ Veterans who meet certain criteria to obtain care outside of the VHA health care system (Department of Veterans Affairs 2015a; Panangala 2015; Commission on Care 2016). However, despite efforts to address health care access issues through the VCA program, utilization has been low, with only 27,000 Veterans having utilized Veterans Choice Program (VCP) providers as of November 2014 (Hegseth 2015). A recent report by the Government Accountability Office (GAO) study found that shortages of primary care

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providers in the community were one reason for low VCP utilization cited by officials from medical centers and the VHA (Government Accountability Office 2016).

In addition to creating the VCP, the Veterans Choice Act also required an independent assessment of VHA's health care delivery systems and established the Commission on Care to review the assessment findings. Based upon extensive analysis of the 4,000-page *Independent Assessment Report* as well as stakeholder engagement, site visits, and public meetings, the Commission developed 18 recommendations to address seven broad areas: the VHA Care System; Clinical Operations; Health Care Equity; Facility and Capital Assets; Information Technology; Governance, Leadership, and Workforce; and Veteran Eligibility (Commission on Care 2016).

Two recommendations focused on community health care needs are the impetus for this analysis. First, the Commission on Care Report suggested conducting community assessments of Veterans' needs, local VHA capacity, and non-VA community providers to assist in capital asset and resource planning. This assessment would assist the VA in identifying areas where VHA will provide services and where it would be efficient to purchase services. Second, the Commission recommended establishing integrated, community care networks of VHA credentialed providers to help address the health care, "misalignment of capacity and demand that threatens to become worse over time" (Commission on Care 2016, p. 3).

While both recommendations focus on local area needs, the Commission's Report does not identify specific geographic areas where there is a potentially critical need for health care providers for Veterans. Given ongoing budget constraints, identifying areas with the highest health workforce needs is important for prioritizing the resource planning suggested by the Commission and for ensuring adequate characterization of local health workforce capacities.

The purpose of the current study is to identify geographic areas where health care provider supply potentially does not meet the health care needs of Veterans. This work is intended to serve as an initial step in characterizing health care capacity for Veterans across the United States. More specifically, this study links geographic information on VHA health facility locations with Health Resources and Services Administration (HRSA)-designated Health Professional Shortage Areas (HPSAs) to identify geographic areas where there are potentially inadequate supplies of health professionals to meet Veteran demands. HRSA-designated HPSAs reflect geographic areas and populations with potentially insufficient provider capacity. Currently, there are

approximately 6,100 primary care HPSAs and 4,000 mental health HPSAs (Health Resources and Services Administration 2016b).

Instead of only reporting acute shortages of health care providers nationally, this analysis seeks to identify specific areas where there are high concentrations of VHA-enrolled Veterans and high health care need. In addition, this study examines two Veteran population subgroups with specific health care needs: women Veterans and Veterans aged 65 years and older. Careful planning related to these populations is becoming increasingly important as Veterans' need for health care intensifies as a consequence of population aging and the commensurate increase in complex health conditions requiring care (Horgan, Taylor, and Wilensky 1983; Selim et al. 2004; Sorrell and Durham 2011).

As the Commission on Care Report also suggested ensuring that Veterans with a service-connected illness, injury, or disability have priority access to care (Commission on Care, 2016, Recommendation 18), this study also considers Veterans in health workforce shortage areas who are receiving service-connected compensation benefits from the VA. Finally, as health care providers are in short supply in rural areas (Ricketts 2005; Hoge et al. 2013) and Veterans are more likely than non-Veterans to live in rural areas (Department of Veterans Affairs 2015b), the rurality of areas where Veterans live is also examined.

DATA

Data for this analysis come from two publicly available resources: HRSA's 2015–2016 Area Health Resource Files (AHRF; ahrh.hrsa.gov) and the VA via VA's Open Data portal (www.va.gov/data). A detailed description of each of the variables used for this analysis is provided below. Data linkages were conducted using the statistical software *R* (version 3.2.3) and *SAS* (version 9.4) (SAS Institute Inc., Cary, NC, USA).

Veteran Population Estimates

The AHRF was used to obtain fiscal year 2015 (FY 2015) county-level estimates of the total number of Veterans, the number women Veterans, and the number of Veterans receiving service-connected compensation in the 50 U.S. states and the District of Columbia. The AHRF contains a collection of county- and state-level data from over 50 different sources on health care professionals, hospitals, health care facilities, and population demographics.

County-level estimates of the FY 2015 population of Veterans aged 65 and older were obtained directly from VA. All Veteran population estimates are as of September 30, 2015, and derive from VetPop 2014, an actuarial projection model developed by VA's Office of the Actuary (http://www.va.gov/vetdata/Veteran_Population.asp). The VA's Office of the Actuary produces official Veteran population projections and estimates of the current Veteran population by demographic characteristic (e.g., age, sex), using VA administrative data and U.S. population mortality data from the U.S. Social Security Administration.

County-level estimates of FY 2015 Veterans enrolled in VHA health care were obtained from VA's Open Data portal (www.va.gov/data). VHA-enrolled Veterans include eligible Veterans whom VA has determined have a service-connected illness or injury, eligible Veterans with gross household incomes below certain geographic limits, and eligible Veterans with gross household incomes above certain limits who agree to co-pays.

VHA Facilities

Veterans Health Administration facility locations were retrieved from VA's Open Data portal (www.va.gov/data). This dataset includes information on facility type, facility name, and, for most facilities, latitude and longitude.

Rural Status

Counties were classified as rural using the 2013 Rural/Urban Continuum Codes from the U.S. Department of Agriculture's Economic Research Service (ERS) (United States Department of Agriculture 2013), which are included in the AHRF. The ERS classifies counties to one of nine codes on a continuum from metro areas of 1 million population or more (1) to completely rural or less than 2,500 urban population, not adjacent to a metro area (9). Counties were considered "rural" if they were completely rural regardless of whether they were adjacent to a metropolitan area (code 8 or 9).

Health Professional Shortage Areas

Data on mental health and primary care Health Professional Shortage Areas (HPSAs) came from the 2015–2016 AHRF. HPSA designations assist federal and state governments in prioritizing resources to areas where there are significant health care needs. HPSA designations consider travel time, population

size, demand for and utilization of health services, number of providers, geographic characteristics, and population groups served (Health Resources and Services Administration 1993, 2015, 2016a,b). Primary care providers were considered if they were osteopathic or allopathic physicians from the following practice areas: General or Family Practice, General Internal Medicine, Pediatrics, and Obstetrics and Gynecology. HPSAs do not consider other types of practitioners who provide primary care services such as those from NPs and physicians assistants. Although the Federal Register defined psychiatrists, clinical psychologists, clinical social workers, psychiatric nurse specialists, and marriage and family therapists as mental health professionals to consider in HPSA designations, most mental health HPSAs were based on the distribution of psychiatrists alone (Health Resources and Services Administration 2015, 2016a). Under these definitions, portions of some counties are considered HPSAs, as are certain populations and facilities (e.g., a correctional facility). However, this study considers geographically defined whole-county and partial-county HPSAs (Health Resources and Services Administration 2016a,b).

METHODS

This study defined a Shortage Area County as a county that (1) has no VHA health or medical facility; and (2) has been designated by HRSA as either a primary care or a mental health geographic HPSA (i.e., either a whole-county HPSA or a partial-county HPSA). Thus, the first step of this analysis involved assigning each VHA health facility to its appropriate county. VHA health facility assignments were made for VHA community-based outpatient clinics (or CBOCs), VHA integrated clinical facilities, VHA outpatient clinics, VA medical centers, and Vet Centers. County assignment of VHA health care facilities was performed using a geocoding procedure available in *Base SAS* 9.4 (proc ginside). SAS was unable to assign 22 VHA facilities to an appropriate county, and county-level determinations were performed manually for these facilities.

The county-level VHA facility assignments were then linked to county-level HPSA categories using Federal Information Processing Series county codes (FIPS codes) to identify Shortage Area Counties. To reiterate, a Shortage Area County is a county that (1) has no VHA health facility; and (2) has been designated either a primary care or a mental health geographic HPSA (i.e., either a whole-county HPSA or a partial-county HPSA).

County-level Veteran population estimates and county-level rural status codes were then linked to the Shortage Area County designations, again using FIPS codes. These summaries were tabulated by state to determine estimates of the total number of Veterans living in Shortage Area Counties in each state. Subpopulation estimates were also tabulated for Veterans enrolled in VHA health care, women Veterans, Veterans aged 65 years and older, and Veterans who receive service-connected compensation from VA (i.e., service-connected Veterans). The statistical software *R* (version 3.2.3) was used to generate these tabulations.

In addition to county- and state-level analyses, this study examined the distribution of Veterans in Shortage Area Counties by U.S. Census division. Census divisions are subdivisions of the four U.S. Census Regions (Northeast, Midwest, South, and West). Each divisional grouping is made up of three to eight states, and thus, Census divisions can afford a more granular view than is possible at the U.S. Census Region level.

RESULTS

Table 1 shows the distribution of Veterans overall, by subgroup, and in Shortage Area Counties. Of the 21,479,000 Veterans in the United States (i.e., Veterans in the 50 U.S. states and the District of Columbia), 8,843,000 Veterans, or 41 percent, are enrolled in VHA, 9 percent are women, and 46 percent are older than 65 years. About 20 percent of all Veterans—or 4,141,000 people—are receiving VA compensation for a service-connected illness, injury or disability. Of the 21 million total Veterans and the approximately 9 million VHA enrollees in the 50 U.S. states and the District of Columbia, between 23 and 24 percent live in Shortage Area Counties. Similarly, about one-quarter of Veterans older than 65 years live in Shortage Area Counties while about 22 percent of women Veterans live in these areas.

These national-level estimates obscure considerable variability at the state level for all Veteran subgroups. For example, the state-level proportion of Enrolled Veterans in Shortage Area Counties is more than twice the national-level proportion in five states (Iowa, Minnesota, South Dakota, Mississippi, and Oklahoma). Using this same criterion of twice the national proportion, two states have disproportionately high levels of women Veterans (Mississippi and Oklahoma), while four states have disproportionate numbers of Veterans aged 65 years and older and service-connected Veterans in Shortage Area Counties. Mississippi consistently has the highest subgroup

Table 1: Veteran Populations, All Counties and Shortage Area Counties, by State, 2015, Population in Thousands

	Total Veteran Population Estimates, by State					Veteran Population Estimates in Shortage Area Counties					Proportion, by Group (Shortage Area Counties/Total)				
	All	Enrolled	Women	Aged 65+	Receiving S-C Compensation	All	Enrolled	Women	Aged 65+	Receiving S-C Compensation	All	Enrolled	Women	Aged 65+	Receiving S-C Compensation
United States	21,479	8,843	2,020	9,833	4,141	5,125	2,060	442	2,333	980	0.24	0.23	0.22	0.24	0.24
Northeast Region															
New England Division															
Connecticut	207	76	17	111	27	22	7	2	11	3	0.10	0.09	0.10	0.10	0.10
Maine	125	57	10	60	26	22	10	2	11	4	0.17	0.17	0.18	0.19	0.16
Massachusetts	368	134	26	197	61	2	0	0	1	0	*	*	0.01	*	*
New Hampshire	111	44	9	53	19	10	5	1	5	2	0.09	0.11	0.09	0.10	0.09
Rhode Island	70	28	5	36	12	10	3	1	6	2	0.15	0.12	0.14	0.16	0.14
Vermont	48	21	3	23	7	16	7	1	7	3	0.34	0.33	0.37	0.31	0.34
Middle Atlantic Division															
New Jersey	413	144	33	229	57	7	2	0	4	1	0.02	0.01	0.01	0.02	0.01
New York	863	389	66	445	127	68	28	5	32	10	0.08	0.07	0.07	0.07	0.08
Pennsylvania	917	352	71	473	118	75	29	6	37	10	0.08	0.08	0.08	0.08	0.08
Midwest Region															
East North Central Division															
Illinois	706	279	55	345	93	190	71	13	91	25	0.27	0.25	0.24	0.26	0.27
Indiana	469	186	36	207	83	169	66	12	78	30	0.36	0.36	0.33	0.38	0.36
Michigan	641	229	46	327	98	193	69	14	98	29	0.30	0.30	0.30	0.30	0.29
Ohio	848	339	68	404	124	158	61	10	75	22	0.19	0.18	0.15	0.19	0.18
Wisconsin	406	168	34	199	67	141	62	11	70	24	0.35	0.37	0.33	0.35	0.36
West North Central Division															
Iowa	228	100	15	109	37	111	50	7	55	18	0.49	0.50	0.44	0.50	0.50
Kansas	218	87	18	96	38	67	26	4	33	10	0.31	0.30	0.24	0.34	0.26
Minnesota	361	162	26	180	89	165	80	11	80	45	0.46	0.49	0.44	0.44	0.50
Missouri	488	200	39	227	87	160	68	11	75	29	0.33	0.34	0.28	0.33	0.33
Nebraska	141	68	12	63	41	51	27	3	26	16	0.36	0.39	0.30	0.41	0.38
North Dakota	57	28	5	24	12	19	9	1	9	3	0.33	0.33	0.26	0.38	0.29
South Dakota	72	39	6	31	15	37	20	3	16	7	0.51	0.50	0.44	0.53	0.46

Continued

Table 1 Continued

Total Veteran Population Estimates, by State					Veteran Population Estimates in Shortage Area Counties					Proportion, by Group (Shortage Area Counties/Total)				
All	Enrolled	Women	Aged 65+	Receiving S-C Compensation	All	Enrolled	Women	Aged 65+	Receiving S-C Compensation	All	Enrolled	Women	Aged 65+	Receiving S-C Compensation
South Region														
South Atlantic Division														
Delaware	77	26	9	37	12	—	—	—	—	—	—	—	—	—
Dist. of Columbia	29	14	4	12	5	—	—	—	—	—	—	—	—	—
Florida	1,558	716	154	785	319	182	76	20	84	40	112	0.13	0.11	0.13
Georgia	752	299	92	287	171	306	116	31	127	63	0.41	0.39	0.34	0.44
Maryland	430	149	58	173	78	41	13	6	14	9	0.10	0.09	0.11	0.08
North Carolina	774	323	85	321	181	320	132	30	144	67	0.41	0.41	0.35	0.45
South Carolina	418	186	47	179	93	143	62	14	63	31	0.34	0.33	0.30	0.35
Virginia	783	262	109	270	178	349	117	47	124	77	0.45	0.45	0.43	0.46
West Virginia	166	81	10	80	31	72	34	4	36	14	0.43	0.43	0.42	0.45
East South Central Division														
Alabama	412	171	43	170	91	190	76	18	80	41	0.46	0.44	0.42	0.47
Kentucky	328	144	25	144	63	134	59	8	60	25	0.41	0.41	0.33	0.42
Mississippi	219	100	20	88	40	150	64	13	62	25	0.69	0.64	0.62	0.71
Tennessee	504	210	46	218	105	205	81	15	97	37	0.41	0.39	0.33	0.44
West South Central Division														
Arkansas	248	117	21	107	47	112	51	9	50	20	0.45	0.44	0.41	0.47
Louisiana	326	134	32	138	60	132	54	12	56	24	0.41	0.40	0.37	0.41
Oklahoma	336	138	30	146	89	177	72	15	80	44	0.53	0.52	0.49	0.50
Texas	1,675	711	180	672	390	375	143	34	172	71	0.22	0.20	0.19	0.26
West Region														
Mountain Division														
Arizona	528	226	55	263	98	6	2	0	3	1	0.01	0.01	0.01	0.01
Colorado	409	159	47	170	95	65	22	6	28	11	0.16	0.14	0.13	0.17
Idaho	132	58	10	60	24	33	14	2	17	5	0.25	0.23	0.18	0.29
Montana	99	50	9	47	20	26	14	2	13	5	0.26	0.27	0.25	0.28
Nevada	225	107	21	105	44	18	8	1	10	3	0.08	0.08	0.07	0.10

Continued

Table 1 Continued

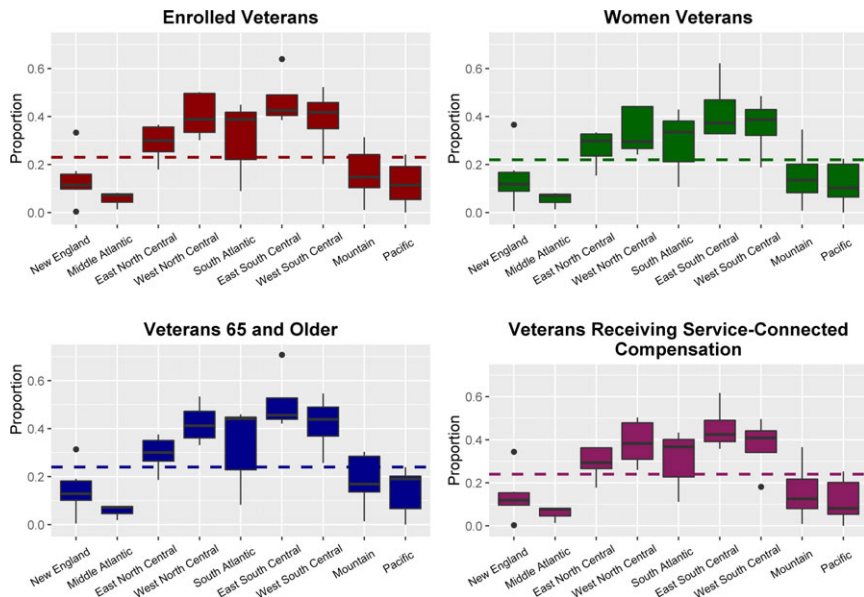
	Total Veteran Population Estimates, by State					Veteran Population Estimates in Shortage Area Counties					Proportion, by Group (Shortage Area Counties/Total)				
	Receiving S-C Compensation					Receiving S-C Compensation					Receiving S-C Compensation				
	All	Enrolled	Women	Aged 65+		All	Enrolled	Women	Aged 65+		All	Enrolled	Women	Aged 65+	
New Mexico	170	75	17	78	36	27	12	2	13	5	0.16	0.15	0.14	0.17	0.13
Utah	151	58	12	68	25	50	18	4	21	9	0.33	0.31	0.35	0.30	0.37
Wyoming	50	26	4	20	10	6	3	0	3	1	0.12	0.11	0.09	0.15	0.08
West Region															
Pacific Division															
Alaska	73	32	10	20	18	12	4	1	4	1	0.16	0.11	0.10	0.19	0.08
California	1,802	749	165	865	360	110	40	11	58	19	0.06	0.05	0.06	0.07	0.05
Hawaii	120	45	13	48	27	<1	<1	<1	<1	<1	*	*	*	*	*
Oregon	326	140	28	165	65	76	34	6	39	16	0.23	0.24	0.22	0.24	0.25
Washington	598	207	65	259	129	114	40	13	52	26	0.19	0.19	0.20	0.20	0.20

Notes: United States: Includes the 50 U.S. states and the District of Columbia. Counties: Includes counties and countylike entities (e.g., parishes in Louisiana). Shortage area county: County has no VHA facility(ies) and county is a HRSA-designated primary care or mental health HPSC (whole county or partial county). VHA facility: Includes VHA-administered Community-Based Outpatient Clinics (CBOCs), Integrated Clinical Facilities, Outpatient Clinics, VA Medical Centers, and Vet Centers. All Veteran populations reflect estimates as of 9/30/2015. S-C: Service-connected Veteran; these estimates reflect Veterans receiving VA compensation for a service-connected illness, injury, or disability. Veteran population estimates have been rounded to the nearest 1,000 Veterans, consistent with recommendations of VA's Office of the Actuary. Delaware and the District of Columbia have no shortage area counties. Calculated proportions reflect the underlying estimates, not the rounded values. Example proportion calculation: Proportion of women Veterans in Shortage Area counties = 442,000/2,020,000 = 0.22.
* <0.01.

percentages in Shortage Area Counties, where the percentages of Veterans aged 65 years and older in Shortage Area Counties is estimated to be 71 percent, while the percentages of enrolled Veterans, women Veterans, and service-connected Veterans are all approximately 60 percent. Hawaii and Massachusetts have the lowest proportions of Veterans living in Shortage Area Counties.

Figure 1 illustrates the variability of Veteran subgroup populations in Shortage Area Counties as a proportion of each state's total Veteran subgroup population. Five Census Divisions have consistently higher proportions of Veterans in Shortage Area Counties: the East North Central Division, the West North Central Division, the South Atlantic Division, the East South Central Division, and the West South Central Division. The remaining four divisions have generally lower proportions of Veterans in Shortage Area Counties

Figure 1: State-Level Population Proportions (Shortage Area Counties vs. All Counties), 2015, by Group and Census Division



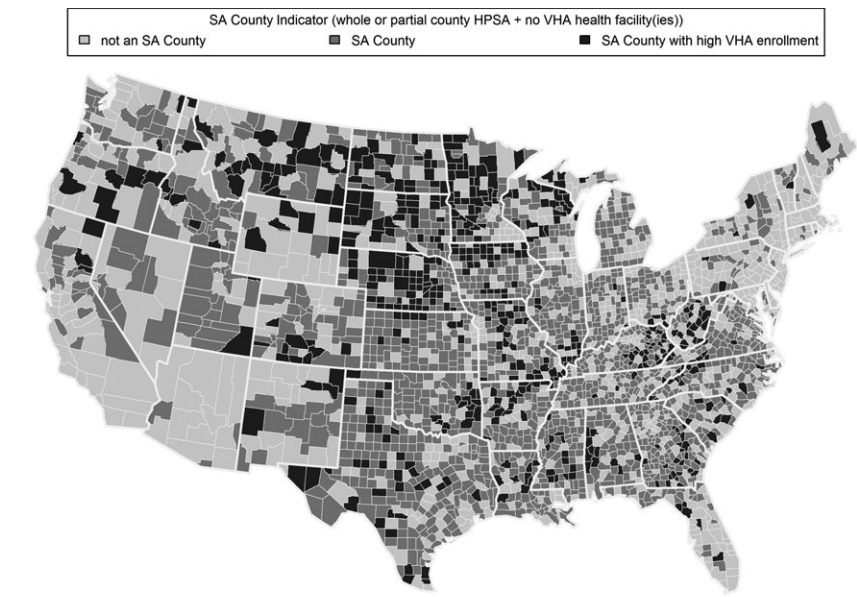
Note: Dashed lines indicate national proportions. For example, the national proportion of Enrolled Veterans in Shortage Area Counties is 0.23. [Color figure can be viewed at wileyonlinelibrary.com].

(New England, Middle Atlantic Division, Mountain Division, and Pacific Division).

Figure 2 shows the distribution of Shortage Area Counties and high VHA enrollment across the United States. One salient trend is the lack of Shortage Area Counties in certain states and regions. Southern California, Arizona, Massachusetts, New Jersey, and other states in the New England Division have numerous contiguous counties that are not considered health workforce shortage counties. Shortage Area Counties with high VHA enrollment (defined as enrollment rates above the third quartile) tend to be more concentrated in areas in the northern United States—such as Montana, Nebraska, South Dakota, North Dakota, and Minnesota—and the Appalachian region covering parts of West Virginia, Kentucky, Virginia, and North Carolina.

The aforementioned geographic trends may be driven in part by the geographic distribution of rural versus nonrural counties, and this is explored in Table 2. Of the 644 rural counties in the United States, 627 are considered

Figure 2: Shortage Area (SA) Counties



HPSA: HRSA-designated health professional shortage area (primary care or mental health or both)
High VHA Enrollment: proportion of enrolled Veterans > 0.493 (3rd quartile)
Not shown: Alaska (24 SA Counties), District of Columbia (0 SA Counties), and Hawaii (1 SA County)

Table 2: Shortage Area Counties, by State

Total Counties	Counties with VHA Facility(ies)	Counties with no VHA Facility	Counties		Shortage Area		Rural Shortage Area Counties	Rural Shortage Area Counties with High Enrollment	Shortage Area Counties as Proportion of Total Counties
			Shortage Area Counties	High VHA Enrollment					
United States	885	2,257	2,143	547	644	627	232	0.68	
Northeast Region									
New England Division									
Connecticut	6	2	2	0	0	0	0	0.25	
Maine	9	7	6	1	2	2	1	0.38	
Massachusetts	12	2	2	0	0	0	0	0.14	
New Hampshire	8	2	2	0	0	0	0	0.2	
Rhode Island	3	2	1	0	0	0	0	0.2	
Vermont	6	8	6	1	3	3	1	0.43	
Middle Atlantic Division									
New Jersey	17	4	1	0	0	0	0	0.05	
New York	43	19	18	2	1	1	0	0.29	
Pennsylvania	44	23	18	2	4	3	1	0.27	
Midwest Region									
East North Central Division									
Illinois	25	77	76	16	10	10	5	0.75	
Indiana	18	74	63	4	5	5	1	0.68	
Michigan	30	53	51	4	14	14	2	0.61	
Ohio	35	53	44	4	2	2	0	0.5	
Wisconsin	20	52	47	20	13	13	8	0.65	
Midwest Region									
West North Central Division									
Iowa	16	83	81	33	20	20	6	0.82	
Kansas	20	85	85	10	42	42	4	0.81	

Continued

Table 2 Continued

	Total Counties	Counties with VHA		Counties with no VHA	Shortage Area		Shortage Area Counties with High VHA		Rural Shortage Area Counties	Rural Shortage Area Counties with High Enrollment	Shortage Area Counties as Proportion of Total Counties
		Facility(ies)	Counties		Counties	Area	Enrollment	Counties			
Minnesota	87	14		73	64	42	19	19	16	0.74	
Missouri	115	30		85	85	32	30	30	15	0.74	
Nebraska	93	11		82	82	50	51	50	33	0.88	
North Dakota	53	9		44	44	19	37	37	16	0.83	
South Dakota	66	12		54	54	29	42	37	20	0.82	
South Region											
South Atlantic Division											
Delaware	3	3		0	0	0	0	0	0	0	
Dist. of Columbia	1	1		0	0	0	0	0	0	0	
Florida	67	37		30	30	5	2	2	0	0.45	
Georgia	159	26		133	129	25	22	21	6	0.81	
Maryland	24	14		10	7	0	0	0	0	0.29	
North Carolina	100	20		80	72	13	16	15	4	0.72	
South Carolina	46	13		33	33	7	1	1	0	0.72	
Virginia	133	24		109	88	10	21	19	3	0.66	
West Virginia	55	17		38	36	18	11	8	5	0.65	
East South Central Division											
Alabama	67	16		51	51	11	11	11	5	0.76	
Kentucky	120	18		102	92	26	36	36	13	0.77	
Mississippi	82	11		71	71	13	21	21	3	0.87	
Tennessee	95	21		74	72	7	16	15	1	0.76	
South Region											
West South Central Division											
Arkansas	75	17		58	57	17	13	13	6	0.76	

Continued

Table 2 Continued

	Total Counties	Counties		Counties		Shortage Area		Rural Counties	Shortage Area Counties	Rural Shortage Area Counties with High Enrollment	Shortage Area Counties as Proportion of Total Counties
		with VHA Facility(ies)	with no VHA Facility	Shortage Area Counties	Shortage Area High VHA Enrollment	Counties with High VHA Enrollment	Rural Counties				
Louisiana	64	16	48	48	9	5	5	1	0.75		
Oklahoma	77	12	65	65	16	16	16	3	0.84		
Texas	254	48	206	197	35	49	49	13	0.78		
West Region											
Mountain Division											
Arizona	15	12	3	3	0	0	0	0	0.2		
Colorado	64	20	44	43	10	20	20	6	0.67		
Idaho	44	11	33	33	7	10	10	2	0.75		
Montana	56	16	40	40	23	29	28	19	0.71		
Nevada	17	7	10	10	0	4	4	0	0.59		
New Mexico	33	16	17	16	4	6	6	4	0.48		
Utah	29	7	22	22	2	5	5	1	0.76		
Wyoming	23	15	8	8	6	4	4	4	0.35		
Pacific Division											
Alaska	29	5	24	24	2	17	17	2	0.83		
California	58	36	22	22	3	4	4	1	0.38		
Hawaii	5	4	1	1	1	0	0	0	0.2		
Oregon	36	18	18	18	6	5	4	1	0.5		
Washington	39	16	23	23	2	5	5	0	0.59		

Notes: United States: Includes the 50 U.S. states and the District of Columbia (Dist. of Columbia). Counties: Includes counties and countylike entities (e.g., parishes in Louisiana). VHA facility: Includes VHA-administered Community-Based Outpatient Clinics (CBOCs), Integrated Clinical Facilities, Outpatient Clinics, VA Medical Centers, and Vet Centers. Shortage area county: County has no VHA facility(ies) and county is a HRSA-designated primary care or mental health HPSA (whole county or partial county). Rural county: USDA Economic Research Service Rural-Urban Commuting Area (RUCA) Code = 8 or 9.

Shortage Area Counties and 232 counties—or 36 percent—are rural shortage area counties with high VHA enrollment (i.e., VHA enrollment rates above the third quartile).

Table 2 also suggests considerable variation by state. For instance, all four rural counties in Wyoming and 80 percent of the rural counties in Minnesota are Shortage Area Counties with high VHA enrollment. However, none of the rural counties in Washington, Nevada, South Carolina, Florida, Ohio, and New York are shortage areas with high VHA enrollment.

Table 2 also reinforces some of the broader trends noted above. For example, approximately 70 percent (2,143) of the 3,142 U.S. counties with Veteran populations are considered Shortage Area Counties. In the 12 states that make up the East North Central and West North Central Divisions, 50 percent or more of each state's counties are considered Shortage Area Counties. Even more markedly, in the eight states that make up the East South Central and West South Central Divisions, 75 percent or more of each state's counties are considered Shortage Area Counties.

DISCUSSION AND CONCLUSIONS

Nationwide, it is estimated that almost one-quarter of all Veterans and those enrolled in VHA live in counties that are health professional shortage areas and do not have VHA health care facilities or medical centers. Almost one-quarter of Veterans older than 65 years and 22 percent of women Veterans live in shortage area counties. However, these estimates mask considerable geographic heterogeneity. Forty-nine states have one or more Shortage Area Counties, while in 32 states, 50 percent or more of the state's counties are considered Shortage Area Counties. Moreover, counties in the South Atlantic Division have a disproportionate number of Veterans in Shortage Area Counties followed by the East North Central and West South Central Divisions of the United States. The highest proportion of Veterans living in Shortage Area Counties—across all subgroups considered—is in Mississippi. Most strikingly, nearly 71 percent of Veterans older than 65 years in Mississippi live in Shortage Area Counties.

Findings from this study reinforce the importance of considering rurality in geographic analyses of Veterans. While shortage area counties with high VHA enrollment tend to be distributed across many states in the United States, many are concentrated in areas in the northern United States—such as Montana, Nebraska, South Dakota, North Dakota, and Minnesota—and the

Appalachian region covering parts of West Virginia, Kentucky, Virginia, and North Carolina. Thirty-six percent of all rural counties in the United States are considered Shortage Area Counties with high VHA enrollment in this analysis. There is also considerable state-by-state heterogeneity. All four rural counties in Wyoming and 80 percent of rural counties in Minnesota are areas with high VHA enrollment and are Shortage Area Counties, whereas none of the rural counties in Washington, Nevada, South Carolina, Florida, Ohio, and New York have this designation.

Global findings from this study are consistent with at least one study of Veterans; however, these findings also underscore local area variability of providers in studies of health care access for Veterans and for policy planning. It is important to note that previous nationally representative studies on Veteran health care access have come to conflicting conclusions. Using the Medical Expenditure Panel Survey from 2006 to 2011, Bernard and Selden (2016) find that nonelderly Veterans were comparable to and non-Veterans in terms of health care access after controlling for various characteristics (Bernard and Selden 2016). However, using data from the 2010–2011 Health Tracking Household Survey, Lee and Begley (2016) find that, after controlling for various characteristics, Veterans were more likely than those with private insurance to report delayed needed medical care (Lee and Begley 2016). On a national level, this study shows that the majority of Veterans across the United States do not live in Shortage Area Counties, a finding consistent with Bernard and Selden (2016). Conversely, findings from this study also show that Veterans living in certain areas in the United States potentially face significant barriers to accessing care—particularly those living in Mississippi and other specific areas mentioned previously. Thus, while some Veterans in the United States do not experience significant barriers to receiving the health care they were promised in exchange for their service to the American people, there remain large populations of Veterans who do.

Nevertheless, these findings, in addition to recommendations from the Commission on Care report, suggest opportunities for the flexible use of health workers. For instance, allowing nurse practitioners (NPs) practice to the fullest extent of their license has been found to be cost-effective and efficient, improving health care quality, health care access, and patient satisfaction (Newhouse et al. 2011; Kutzleb et al. 2015; Kilpatrick, Jabbour, and Fortin 2016; Riley, Litsch, and Cook 2016). Recognizing these potential benefits, the Department of Veterans Affairs proposed a rule that would grant full practice authority to Advanced Practice Registered Nurses (APRN) when they are acting within the scope of their VA employment. Expanding the scope of practice

for NPs is also a Commission on Care recommendation for increasing access to quality health care for Veterans. This change could potentially enhance health care access for Veterans living in shortage areas in Mississippi, West Virginia, Kentucky, Virginia, and North Carolina, where APRN scope of practice is either reduced or restricted. Although Service Area Counties reflect areas where there are no VHA facilities, expanding APRN scopes of practice could increase the availability of providers to Veterans whose services can be purchased by VHA.

Despite the strengths of using current county-level data to identify geographic trends, this study has several limitations. First, counties are the smallest level of analysis considered, and this unit of analysis is not sufficiently granular in many—if not most—cases to address community-level needs. Unfortunately, HRSA's HPSA designations and the publicly available Veteran population data do not permit a more granular analysis. Second, this study relates to the use of VHA health facility locations as a proxy for the supply of VHA providers. Providers may be geographically spread across multiple counties and some VHA facilities may have potentially inadequate capacities. Thus, this assumption may lead to an underestimation in the number of Shortage Area Counties and in the attendant Veteran populations in these Counties. Third, the current study does not consider specific types of providers. For instance, neither access to obstetricians/gynecologists for women Veterans nor access to geriatricians for Veterans aged 65 years and older are captured in this analysis.

Access to health care is complicated and not driven solely by the presence or absence of providers or facilities, which broadens opportunities for future research. Provider capacity, provider willingness to accept new patients, specialty, and cultural competence all factor into whether, where, and how needed health care is obtained (Agency for Healthcare Research and Quality 2014; Commission on Care 2016). Logistical constraints (travel time, transportation availability, etc.) can be major drivers in determining health care access. An individual's health literacy and ability to seek care can also have a profound influence on access to health care services. While the county-level analysis presented herein was not able to take these factors into account, it is hoped that this analysis can serve as an initial step in characterizing health care capacity for Veterans across the United States, and that it can help to provide the foundation for targeted, community-level analyses in which provider capacity, provider specialty, and other factors are examined. For example, a Census block group or tract-level analysis, using nonpublic data available through VA or through the U.S. Census, may provide important information,

especially in states with a high proportion of Shortage Area Counties. Targeted analyses of specific provider types and Veteran subpopulations (e.g., the supply obstetrician/gynecologists versus the population of Women Veterans) may also be informative for states where there large proportions of Veterans or Veteran subpopulations in Shortage Area Counties.

Veterans Affairs is working to substantially improve Veterans' access to health care, and VA's FY 2017 budget includes funds to expand community programs, strengthen and integrate mental health services, construct and upgrade VHA facilities, provide medical education, and institute other initiatives to improve the ability of eligible Veterans to obtain needed health care (Department of Veterans Affairs 2016). Many of these initiatives explicitly target geographically remote settings. Other agencies are also working to strengthen the health workforce, improve access, and more effectively integrate primary care and behavioral health for all Americans. Ensuring that all Veterans have adequate access to health care is a shared challenge for the U.S. health care system—a challenge that requires a detailed understanding of the widespread geographic imbalances in provider supply. It is hoped that this study provides a first step in informing those analyses.

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Disclaimer: None.

NOTE

1. Eligibility for VHA health care generally requires completion of a defined period of active military, naval, or air service, together with a discharge from military service under a condition other than dishonorable (Title 38 2011; Gasper et al. 2015). These

service requirements may be lessened for individuals with a service-connected disability or condition. Purple Heart recipients, Medal of Honor recipients, Former Prisoners of War, and certain other former Service Members may be granted enhanced eligibility when enrolling in the VHA health care system.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.